

CLAIMS

We claim:

1. An adjustable nozzle assembly through which a lancet can be propelled by a lancing device into a lancing surface, the adjustable nozzle assembly comprising:

5 an interior nozzle comprising a ramped groove and a lancet wall;

a collar comprising a collar pin that engages the ramped groove and slides relative to the ramped groove, the collar being adapted to rotate relative to the interior nozzle; and

10 an exterior nozzle comprising a contact surface that extends beyond the lancet wall of the interior nozzle to contact the lancing surface, the exterior nozzle engaging the collar and being adapted to rotate relative to the interior nozzle; and

wherein the ramped groove is sloped such that as the exterior nozzle rotates relative to the interior nozzle, the distance that the contact surface extends beyond the lancet wall changes by an amount that corresponds to the slope of the ramped groove.

15 2. The nozzle assembly of claim 1, wherein the collar further comprises a cantilevered detent and wherein the interior nozzle further comprises a plurality of adjustment notches that can engage the cantilevered detent.

3. The nozzle assembly of claim 1, wherein:

20 the collar further comprises a sloped collar ramp, the sloped collar ramp comprising a detent; and

the interior nozzle further comprises a sloped interior nozzle ramp, the sloped interior nozzle ramp comprising a plurality of adjustment notches that can engage the detent; and

wherein the slope of the collar ramp, the slope of the interior nozzle ramp, and the slope of the ramped groove are approximately equal.

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4. The nozzle assembly of claim 3, wherein the detent forms a cantilevered portion of the collar ramp.

5. The nozzle assembly of claim 3, wherein the detent forms a slotted portion of the
10 collar ramp.

6. The nozzle assembly of claim 1, wherein the interior nozzle further comprises an assembly groove, one end of the assembly groove being in proximity to one end of the ramped groove, the assembly groove comprising a raised boss that can oppose the collar pin sliding from
15 the ramped groove to the assembly groove.

7. The nozzle assembly of claim 1, wherein the collar further comprises one or more collar alignment features, and the exterior nozzle further comprises one or more exterior nozzle alignment features that can engage the one or more collar alignment features.

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8. The nozzle assembly of claim 1, wherein the contact surface is concave.

9. The nozzle assembly of claim 1, wherein the ramped groove comprises an over-rotation groove.

10. A rearward body assembly of a lancing device that can propel a lancet into a lancing surface, the rearward body assembly comprising:

a lancet holder comprising one or more retaining features and one or more spring surfaces;

an interior tube comprising an open end and a slotted end through which the one or more retaining features extend, the interior tube being adapted to slidably engage the lancet holder;

an internal compression spring comprising a first end and a second end, the first end of the internal compression spring being adapted to act on the slotted end of the interior tube and the second end of the internal compression spring being adapted to act on the one or more spring surfaces of the lancet holder;

a retainer comprising a slotted surface through which the one or more retaining features extend;

a rearward body, the rearward body engaging the retainer; and

an external compression spring comprising a first end and a second end, the first end comprising a reduced coil diameter that engages the one or more retaining features of the lancet holder, the first end of the external compression spring being adapted to act on the lancet holder and the second end of the external compression spring being adapted to act on the slotted surface of the retainer; and

wherein longitudinal movement of the rearward body away from the interior tube compresses the interior compression spring.

11. The lancing device of claim 10, wherein the lancet holder further comprises a trigger extension, the trigger extension being adapted to engage both a trigger and the interior tube to load the lancing device and to oppose the force of the compression spring until the trigger is actuated.

12. The lancing device of claim 10, wherein the retainer further comprises one or more retainer alignment features, and the rearward body further comprises one or more rearward body alignment features that can engage the one or more retainer alignment features.

13. A lancing device that can propel a lancet into a lancing surface, the lancing device comprising:

(i) an adjustable nozzle assembly through which the lancet can be propelled into a lancing surface, the adjustable nozzle assembly comprising:

an interior nozzle comprising a ramped groove and a lancet wall;

a collar comprising a collar pin that engages the ramped groove and slides relative to the ramped groove, the collar being adapted to rotate relative to the interior nozzle; and

an exterior nozzle comprising a contact surface that extends beyond the lancet wall of the interior nozzle to contact the lancing surface, the exterior nozzle engaging the collar and being adapted to rotate relative to the interior nozzle; and

wherein the ramped groove is sloped such that as the exterior nozzle rotates relative to the interior nozzle, the distance that the contact surface extends beyond the lancet wall changes by an amount that corresponds to the slope of the ramped groove; and

(ii) a rearward body assembly, the rearward body assembly comprising:

a lancet holder comprising one or more retaining features and one or more spring surfaces;

an interior tube comprising an open end and a slotted end through which the one or more retaining features extend, the interior tube being adapted to slidably engage the lancet holder;

an internal compression spring comprising a first end and a second end, the first end of the internal compression spring being adapted to act on the slotted end of the interior tube and the second end of the internal compression spring being adapted to act on the one or more spring surfaces of the lancet holder;

a retainer comprising a slotted surface through which the one or more retaining features extend;

a rearward body, the rearward body engaging the retainer; and

an external compression spring comprising a first end and a second end, the first end comprising a reduced coil diameter that engages the one or more

retaining features of the lancet holder, the first end of the external compression spring being adapted to act on the lancet holder, and the second end of the external compression spring being adapted to act on the slotted surface of the retainer; and

5 wherein longitudinal movement of the rearward body away from the interior tube compresses the interior compression spring; and
wherein the rearward body assembly can releasably engage the adjustable nozzle assembly.

10 14. The lancing device of claim 13, wherein the collar further comprises a cantilevered detent and wherein the interior nozzle further comprises a plurality of adjustment notches that can engage the cantilevered detent.

15 15. The lancing device of claim 13, wherein:
15 the collar further comprises a sloped collar ramp, the sloped collar ramp comprising a cantilevered detent; and

the interior nozzle further comprises a sloped interior nozzle ramp, the sloped interior nozzle ramp comprising a plurality of adjustment notches that can engage the cantilevered detent; and

20 wherein the slope of the collar ramp, the slope of the interior nozzle ramp, and the slope of the ramped groove are approximately equal.

16. The lancing device of claim 15, wherein the detent forms a cantilevered portion of the collar ramp.

17. The lancing device of claim 15, wherein the detent forms a slotted portion of the collar ramp.

18. The lancing device of claim 13, wherein the interior nozzle further comprises an assembly groove, one end of the assembly groove being in proximity to one end of the ramped groove, the assembly groove comprising a raised boss that can oppose the collar pin sliding from the ramped groove to the assembly groove.

19. The lancing device of claim 13, wherein the collar further comprises one or more collar alignment features, and the exterior nozzle further comprises one or more exterior nozzle alignment features that can engage the one or more collar alignment features.

20. The lancing device of claim 13, wherein the contact surface is concave.

21. The lancing device of claim 13, wherein the ramped groove comprises an over-rotation groove.

22. The lancing device of claim 13, wherein the lancet holder further comprises a trigger extension, the trigger extension being adapted to engage both a trigger and the interior

tube to load the lancing device and to oppose the force of the compression spring until the trigger is actuated.

23. The lancing device of claim 13, wherein the retainer further comprises one or more retainer alignment features, and the rearward body further comprises one or more rearward body alignment features that can engage the one or more retainer alignment features.

24. A method of assembling an adjustable nozzle assembly of a lancing device, the method comprising:

providing an interior nozzle comprising an assembly groove in communication with a ramped groove, the assembly groove being separated from the ramped groove by a raised boss;

providing a collar with a collar pin; and

attaching the collar to the interior nozzle by sliding the collar pin in the assembly groove, over the raised boss, and into the ramped groove.

25. The method of claim 24, wherein the collar further comprises a cantilevered detent and wherein the interior nozzle further comprises a plurality of adjustment notches that can engage the cantilevered detent.

26. The method of claim 24, wherein:
the collar further comprises a sloped collar ramp, the sloped collar ramp comprising a cantilevered detent; and

the interior nozzle further comprises a sloped interior nozzle ramp, the sloped interior nozzle ramp comprising a plurality of adjustment notches that can engage the cantilevered detent; and

wherein the slope of the collar ramp, the slope of the interior nozzle ramp, and the slope of the ramped groove are approximately equal.

27. The lancing device of claim 26, wherein the detent forms a cantilevered portion of the collar ramp.

28. The lancing device of claim 26, wherein the detent forms a slotted portion of the collar ramp.

29. The method of claim 24, wherein the raised boss can oppose the collar pin sliding from the ramped groove to the assembly groove.

30. The method of claim 24, wherein the ramped groove comprises an over-rotation groove.

31. The method of claim 24, wherein the collar further comprises one or more collar alignment features, the method further comprising:

providing an exterior nozzle comprising one or more exterior nozzle alignment features that can engage the one or more collar alignment features;

aligning the one or more collar alignment features with the one or more exterior nozzle alignment features; and

engaging the exterior nozzle to the collar.

5 32. A method of adjusting a lancing depth of a nozzle assembly in a lancing device, the nozzle assembly comprising an exterior nozzle, an interior nozzle comprising a ramped groove, and a collar engaging the exterior nozzle and comprising a collar pin that can slidably engage the ramped groove, the method comprising:

10 rotating the exterior nozzle and the collar relative to the interior nozzle to slide the collar pin in the ramped groove of the interior nozzle to adjust the lancing depth.

15 33. The method of claim 32, wherein the collar further comprises a collar ramp, the collar ramp comprising a detent, and the interior nozzle further comprises an interior nozzle ramp, the interior nozzle ramp comprising a plurality of adjustment notches that can engage the detent, and wherein rotating the exterior nozzle and the collar relative to the interior nozzle to slide the collar pin in the ramped groove of the interior nozzle to adjust the lancing depth further comprises:

20 selecting the lancing depth by rotating the exterior nozzle to engage the detent with one of the adjustment notches.

34. The method of claim 33, wherein the slope of the collar ramp, the slope of the interior nozzle ramp, and the slope of the ramped groove are approximately equal.

35. The method of claim 33, wherein the detent forms a cantilevered portion of the collar ramp.

5 36. The method of claim 33, wherein the detent forms a slotted portion of the collar ramp.

37. The method of claim 33, wherein the ramped groove comprises an over-rotation groove.

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